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**(54) Clutch actuator system for automatic/semi-automatic mechanical transmission system.**

**(57) A clutch actuator system (100) for an automatic/semi-automatic mechanical transmission (10) is provided which utilizes the clutch actuation components normally provided for manually operated transmissions with the addition of an ECU (38) controlled automatic clutch actuator (30).**

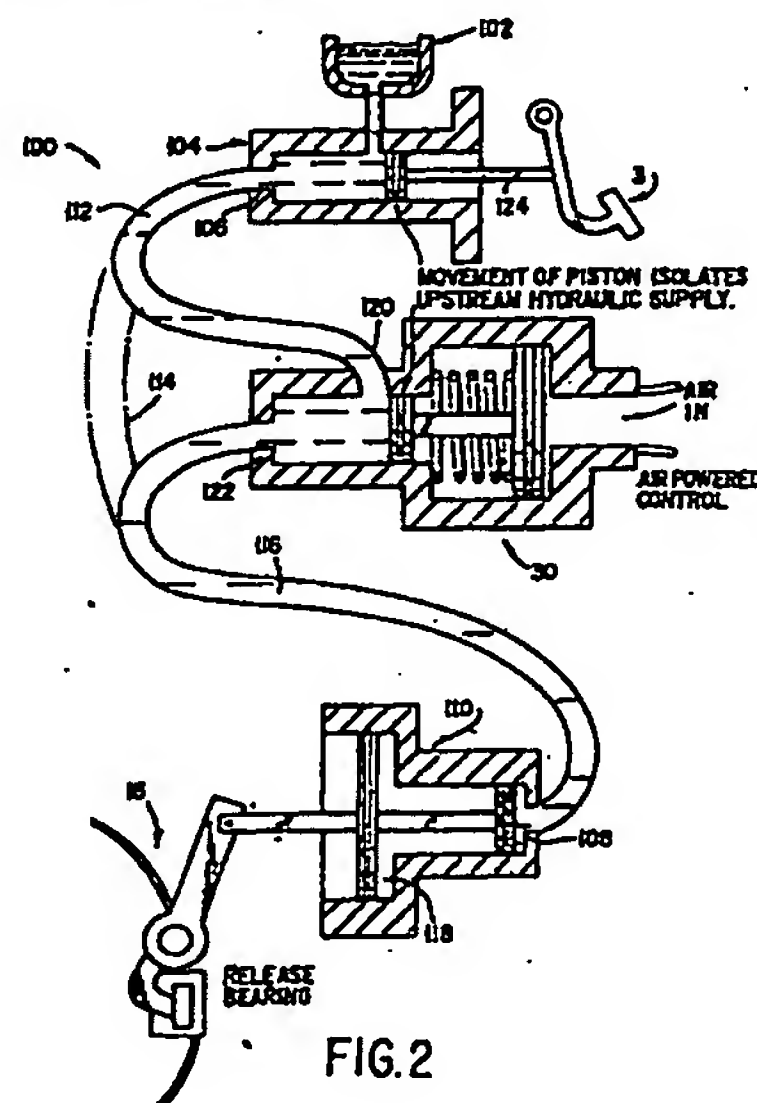


FIG. 2

## Description

### CLUTCH ACTUATOR SYSTEM FOR AUTOMATIC/SEMI-AUTOMATIC MECHANICAL TRANSMISSION SYSTEMS

#### BACKGROUND OF THE INVENTION

##### Field of the Invention

The present invention relates to a clutch actuator system for use in automatic/semi-automatic mechanical transmission systems (AMT/SAMT). In particular, the present invention relates to a clutch actuation system for AMT/SAMT use which utilizes the standard components of the clutch actuation system normally provided (usually by the vehicle assembler) for manually operated master clutches.

##### The Prior Art

Automatic mechanical transmission systems (AMTs) and semi-automatic mechanical transmission systems (SAMTs) are known in the prior art as may be seen by reference to United States Patent Nos. 4,361,060; 4,527,447 and 4,648,290, the disclosures of which are hereby incorporated by reference. The prior art systems utilized an engagable and disengagable master friction clutch drivingly interposed the vehicle engine and the transmission gearing. Control means, usually microprocessor based, are utilized to provide command output signals to actuators to automatically operate the clutch and transmission based upon sensed inputs and predetermined logic rules. The systems could be "two-pedal" systems with only automatic clutch actuation or "three-pedal" systems having manual as well as automatic clutch actuation for start-from-stop and/or other modes of operation.

In the prior art systems, the AMT/SAMT systems utilized fully integrated clutch actuation systems which utilized little or none of the actuation/assist mechanisms normally provided by the vehicle manufacturers for manual transmission systems. This may require the vehicle manufacturer to utilize and/or design-in components with which he is not familiar.

#### SUMMARY OF THE INVENTION

In accordance with the present invention, the drawbacks of the prior art have been minimized by the provision of an AMT/SAMT clutch actuator system utilizing many of the master clutch control components typically provided, and engineered into, vehicles having a manual transmission system.

The above is accomplished by utilizing the standard clutch actuator, reservoir, assist mechanism and/or standard master-cylinder and inserting an additional automatically controlled actuator in the control circuit.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic illustration of a prior art semi-automatic mechanical transmission system.

Figure 2 is a schematic illustration of the clutch actuation system of the present invention.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 illustrates an AMT/SAMT system 10 of the "three pedal" type having a throttle pedal 24, a brake pedal (not illustrated) and a clutch pedal 3. It is understood that the present invention is also applicable to "two-pedal" type system having only a throttle pedal and a brake pedal. Transmission systems of the type illustrated in Figure 1 may be appreciated in greater detail by reference to above-mentioned US Patent No. 4,648,290.

Referring to Figure 1, the position of a driver-operated throttle 24 is sensed at sensor 22 and fed to a central processing unit 38, which also receives inputs relative to engine speed from sensor 28 and/or transmission input shaft speed from sensor 32, from transmission output shaft speed from sensor 36, and from positive or negative actuations of the driver's gear shift lever, or "joy stick" 1. It is understood that engine speed is an indication of transmission input shaft speed, and visa versa, especially if clutch 16 is nonslippingly engaged.

Control logic circuits, sensors and actuators for the transmission system 10 as disclosed in Figure 1 may be as disclosed in U.S. Patent No. 4,361,060, the disclosure of which is hereby incorporated by reference. Specifically, central processing unit 38 receives inputs, processes same in accordance with predetermined logic rules and provides command output signals to pneumatic and/or electrical actuators for control of an exhaust brake 17 and/or an input shaft brake 18 for rapid upshifts, and automatic fuel control 26 to "blip" the supply of fuel to the engine 14 to achieve rapid synchronous rotation preparatory to a downshift, clutch control via operator 30, and ratio shifting via transmission operator 34. The central processing unit also sends command output signals to the display 2 to be described in greater detail below. The semi-automatic transmission system 10 additionally comprises a usual foot operated manual clutch control 3 intended for use only for start from rest and/or low speed creeping maneuvering situations. The semi-automatic mechanical transmission system 10 also includes sources of electric and/or pneumatic power (not illustrated).

Figure 2 illustrates the clutch control system 100 of the present invention as utilized with the SAMT system 10 illustrated in Figure 1.

The clutch actuation system 100 makes use of the existing standard manual clutch control components predesigned into a particular vehicle by the vehicle builder. This minimizes component and installation engineering costs. The standard manual clutch control system includes an hydraulic reservoir 102 supplying hydraulic fluid to a master cylinder 104 operated by the clutch pedal 3. The master cylinder output 106 is normally connected to the input 108 of a clutch actuator 110 by fluid lines 112, 114 and 116. The clutch actuator typically includes a servo-assist mechanism 118 to minimize force required at the

pedal 3, and use of the existing assist mechanism minimizes the size of required AMT/SAMT clutch actuation devices.

All of the existing components are, of course, available to and designed into existing vehicles making the use of an AMT/SAMT easier and less costly to a vehicle manufacturer.

To provide automatic clutch operation, an automatic clutch operator 30 is interposed the standard master cylinder 104 and the standard clutch actuator 110.

The actuator 30 is controlled directly or indirectly by command output signals from CPU 38 and includes an inlet 120 connected to the reservoir 102 by conduit 112 and an outlet 122 connected to the standard clutch actuator 110 by conduit 116. As is shown, upon actuation of either the master cylinder 104 or the automatic actuator 30, fluid connections to upstream hydraulic connections are closed.

In the illustrated three pedal system, the clutch may be operated by either the manual pedal 3 or the CPU 38. In a two-pedal system, the reservoir 102 is connected directly to conduit 112, and the pedal 3 and master cylinder 104 may be eliminated from system 100. Alternatively, in a two pedal system, conduits 112 and 116 could be directly fluidly connected (as by conduit 114) and the actuator 30 could act on the linkage 124 normally manipulated by the clutch pedal 3.

Although the present invention has been described in its preferred forms with a certain degree

of particularity, it is understood that the present disclosure of the preferred forms is by way of example only and that numerous changes in the details of construction and combination or arrangement of the parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

## Claims

1. An automatic clutch actuator system (110) for use with automatic/semi-automatic transmission systems (10), said system of the type utilizing a fluid reservoir (102) fluidly connected to a standard clutch actuator (110), said system characterized by:

an automatic clutch actuation operator (30) having an inlet (120) fluidly connected to said reservoir and an outlet (122) fluidly connected to standard clutch actuator, said automatic clutch actuator operator (36) responsive to command signals from a control (38) to pressurize said fluid at said outlet and to block said inlet.

2. The system (100) of claim 1 wherein a manually operable master cylinder (104) is fluidly interposed said reservoir (102) and said actuator (110), said master cylinder effective to pressurized fluid at said outlet (122).

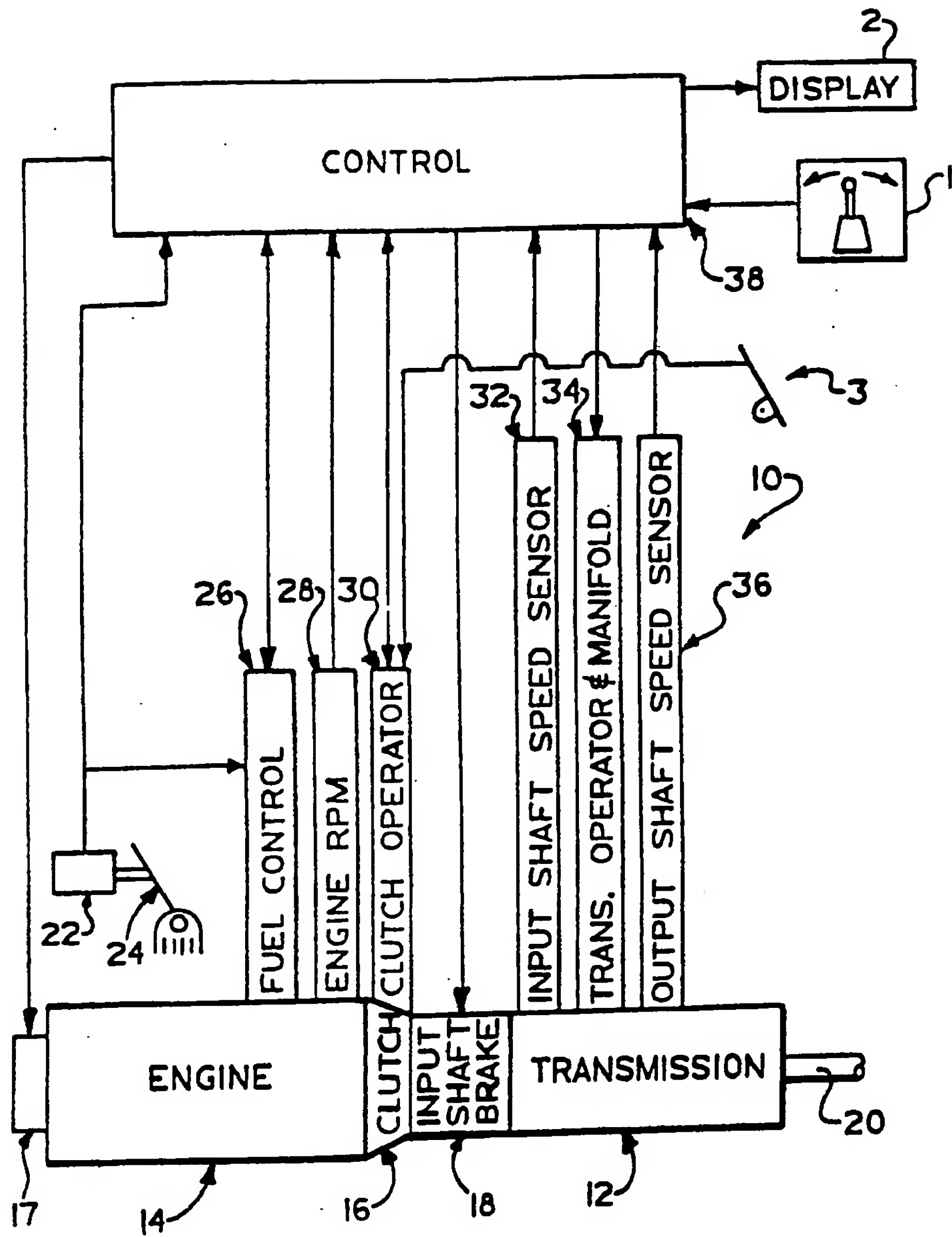
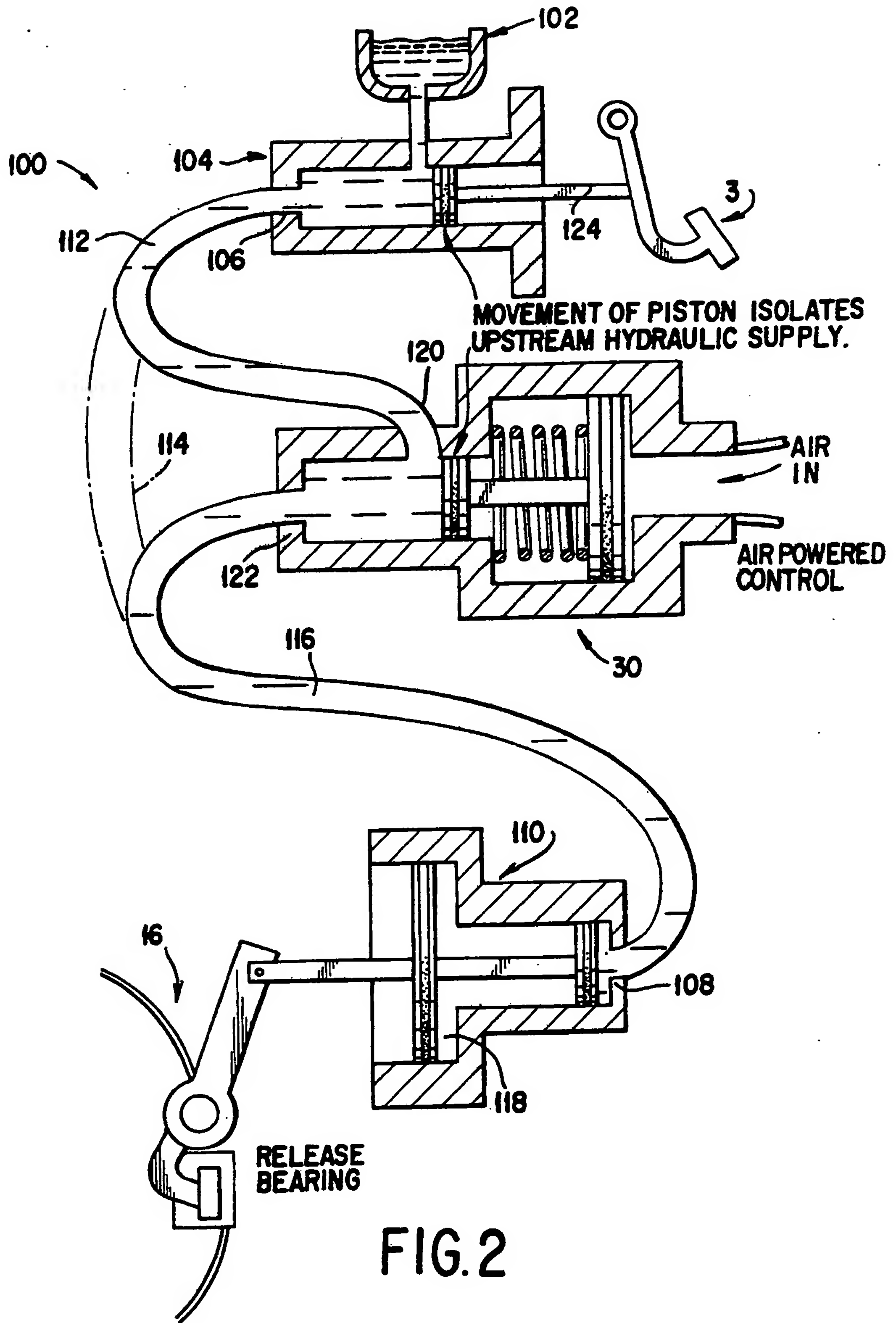


FIG. 1





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 89 30 0118

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL 4)
X	DE-A-3 246 362 (DAIMLER-BENZ) * Page 5, lines 13-28; page 7, line 25 - page 8, line 11; figures 1,2,4 * ---	1,2	F 16 D 25/14
X	EP-A-0 231 465 (BOSCH) * Page 6, line 28 - page 10, line 6; figure 1 * ---	1,2	
X	EP-A-0 239 471 (BENDIX) * Column 1, lines 3-6,24-34; column 1, line 47 - column 3, line 26; figure 1 * ---	1	
A	---	2	
X	EP-A-0 158 004 (WABCO) * Page 3, lines 14-21; page 4, line 33 - page 5, line 19; figure 1 * ---	1	
A	DE-A-3 010 503 (VOLKSWAGENWERK) * Whole document * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int. CL 4)
			B 60 K F 16 D
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 20-04-1989	Examiner CLASEN M.P.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			